

AMENDMENTS TO THE CLAIMS

The listing of claims below replaces all prior versions of claims in this application.

1. (Previously Presented): A bending action member comprising:

a movable means in which a front end side portion thereof is bendable;

a link mechanism that transmits drive power to the movable means;

a cylindrical frame that is connected to the movable means and contains a hollow portion accommodating the link mechanism; and

an air-tight link guide portion provided in the hollow portion of the cylindrical frame that holds and guides the link mechanism as the link mechanism moves to transmit the drive power to the movable means.

2. (Currently Amended): The bending action member according to claim 1 wherein the air-tight ~~member~~ link guide portion makes a sliding contact with the ~~drive power transmitting means~~ link mechanism when the drive power is transmitted to the movable means by the ~~drive power transmitting means~~ link mechanism.

3. (Previously Presented): The bending action member according to claim 1, wherein the movable means comprises a plurality of articulation portions and adjoining two articulation portions of the plurality of the articulation portions are so constructed that an articulation portion on a rear end side starts its bending action after a bending of an articulation portion on a front

end side ends.

4. (Previously Presented): The bending action member according to claim 1 wherein a pair of forceps members constructed such that at least one of them is rotatable is provided at a front end of the movable means, and

the pair of the forceps members is capable of gripping a solid object corresponding to a drive power transmitted by the drive power transmitting means.

5. (Previously Presented): A manipulator comprising:

a movable means in which a front end side portion thereof is bendable;

a motor that generates drive power for operating the movable means;

a link mechanism that transmits drive power generated by the motor to the movable means;

a cylindrical frame that is connected to the movable means and contains a hollow portion accommodating the link mechanism; and

an air-tight link guide portion provided in the hollow portion of the cylindrical frame that holds and guides the link mechanism as the link mechanism moves to transmit the drive power to the movable means.

6. (Currently Amended): The manipulator according to claim 5 wherein the air-tight member link guide portion makes a sliding contact with the ~~drive power transmitting means~~ link

mechanism when the drive power is transmitted to the movable means by the ~~drive power transmitting means~~ link mechanism.

7. (Previously Presented): The manipulator according to claim 5, wherein the movable means is constituted of a plurality of articulation portions and adjoining two articulation portions of the plurality of the articulation portions are so constructed that an articulation portion on a rear end side does not start its bending action until a bending of an articulation portion on a front end side ends.

8. (Previously Presented): The manipulator according to claim 5, wherein a pair of forceps members constructed such that at least one of them is rotatable is provided at the front end side of the movable means, and

the pair of the forceps members grips a solid object by transmitting a drive power generated by the drive power generating means with the drive power transmitting means.

9. (Currently Amended): A multi-slider linkage mechanism, comprising:

a movable means having a plurality of articulation portions and constructed to be bendable,

wherein the plurality of articulation portions include a first articulation portion on a front end side and a second articulation portion on a rear end side that are constructed to be bendable to the same side and adjoin each other, and the first articulation portion and the second

articulation portion are so constructed that a bending action at the second articulation portion starts after a bending action at the first articulation portion ends, and

wherein the second articulation portion includes a joint portion that is so constructed that the joint portion causes a magnitude of a moment required for starting the bending action of the second articulation portion ~~[[is]]~~ to be larger than a moment required for the bending action of the first articulation portion.

10. (Currently Amended): The multi-slider linkage mechanism according to claim 9, wherein the joint portion of the second articulation portion ~~has~~ includes

~~a rotary shaft perpendicular to the bending direction of the bending action, and~~

a first frame member having a first coupling portion; and

a second frame member having a second coupling portion; and

a common rotary shaft and constituting the second articulation portion are so constructed that is perpendicular to the bending direction of the bending action and that joins the first coupling portion and the second coupling portion,

~~the first frame member has a first coupling portion;~~

~~the second frame member has a second coupling portion;~~

~~the first coupling portion and the second coupling portion are jointed with the rotary shaft used in common; and~~

wherein the first coupling portion and the second coupling portion are so constructed that
a force generated in a direction along the rotary shaft is increased between the first coupling

portion and the second coupling portion accompanied by the bending action of the second articulation portion.

11. (Currently Amended): The multi-slider linkage mechanism according to claim 10 wherein a contact face of the first coupling portion with the second coupling portion and ~~[[the]]~~ a contact face of the second coupling portion with the first coupling portion are tapered forward so that the respective contact faces follow each other when it is not bent.

12. (Currently Amended): A bending action member, comprising:

a movable means having a plurality of articulation portions at its front end side portion and constructed to be bendable; and

a drive power transmitting means constructed to be capable of transmitting the drive power to the movable means,

wherein a first articulation portion on the front end side and a second articulation portion on a rear end side that are constructed to be bendable to the same side and adjoin each other of the plurality of the articulation portions are so constructed that a bending action at the second articulation portion starts after a bending action at the first articulation portion ends, and

wherein the second articulation portion includes a joint portion that is so constructed that the joint portion causes a magnitude of a moment required for starting the bending action of the second articulation portion ~~[[is]]~~ to be larger than a moment required for the bending action of the first articulation portion.

13. (Currently Amended): A manipulator comprising:

a movable means having a plurality of articulation portions at its front end portion and constructed to be bendable;

a drive power generating means constructed to be capable of generating a drive power for operating the movable means; and

a drive power transmitting means constructed to be capable of transmitting the drive power generated by the drive power generating means to the movable means,

wherein a first articulation portion on the front end side and a second articulation portion on a rear end side that are constructed to be bendable to the same side and adjoin each other of the plurality of the articulation portions are so constructed that a bending action at the second articulation portion starts after a bending action at the first articulation portion ends, and

wherein the second articulation portion includes a joint portion that is so constructed that the joint portion causes a magnitude of a moment required for starting the bending action of the second articulation portion [[is]] to be larger than a moment required for the bending action of the first articulation portion.

14. (Previously Presented): The manipulator according to claim 13, wherein

a pair of forceps members constructed such that at least one of them is rotatable is provided at the front end portion of the movable means, and

the pair of the forceps members is capable of gripping a solid object by transmitting a

drive power generated by the drive power generating means with the drive power transmitting means.

15. (Currently Amended): A bending action member, comprising:
a movable means constructed such that its front end side portion is bendable;
a drive power transmitting means constructed of at least one link member capable of transmitting a drive power to the movable means; and
a first joint portion connected to ~~[[at]]~~ an end of the at least one link member,
wherein the first joint portion includes a projection that ~~can be~~ is releasably connected to a drive power generating means for generating the drive power, and the drive power transmitting means is so constructed to transmit the drive power from the drive power generating means to the movable means when the first joint portion is connected to the drive power generating means and to not transmit the drive power from the drive power generating means to the movable means when the connection between the first joint portion and the drive power generating means is released.

16. (Previously Presented): The bending action member according to claim 15, wherein the movable means has a plurality of articulation portions, and
a first articulation portion on the front end side and a second articulation portion on a rear end side that are constructed to be bendable to the same side and adjoin each other of the plurality of the articulation portions are so constructed that a bending action at the second

articulation portion starts after a bending action at the first articulation portion ends.

17. (Currently Amended): The bending action member according to claim 15, wherein ~~the first joint portion has a projecting portion, and~~
the ~~projecting portion~~ projection is capable of being fitted to a fitting hole made in a second joint portion composed of an elastic body that has the fitting hole and urges substantially perpendicularly to a transmitting direction of the drive power.

18. (Previously Presented): An actuator constructed to be capable of engaging/disengaging a bending action member provided with a movable means at its front end side portion comprising:

a drive power generating means capable of generating a drive power for operating the movable means;

a first joint portion connected to a link member that transmits the drive power to the movable means, the first joint portion having a projecting portion;

a second joint portion connected to the drive power generating means, the second joint portion including an elastic body having a fitting hole, and the elastic body can be elastically urged in a direction substantially perpendicular to a transmitting direction of the drive power, and

wherein the second joint portion is connected to the drive power generating means in such a manner that the second joint portion is initially advanced substantially linearly by the drive power of the drive power generating means without the projecting portion being fitted into

the fitting hole, and the projecting portion is arranged such that the second joint portion is connected to the first joint portion by advancing the second joint portion substantially linearly until the projecting portion is fitted into the fitting hole while an urging force is applied to the first joint portion by the elastic body.

19. (Currently Amended): A manipulator comprising:

a bending action member including a movable means constructed such that its front end side portion is bendable and a drive power transmitting means capable of transmitting a drive power applied from outside to the movable means; and

an actuator having a drive power generating means capable of generating a drive power for operating the movable means,

wherein the bending action member and the actuator are constructed to be capable of engaging/disengaging each other,

a first joint portion provided on the drive power transmitting means and a second joint portion provided on the drive power generating means are provided to be connectable and separable,

a coupling between the first joint portion and the second joint portion is executed after
are arranged such that the first joint portion and the second joint portion are not coupled to each
other when the bending action member and the actuator are joined initially joined together, and
such that the second joint portion is movable along a transmitting direction of the drive power by
the drive power generating means to become coupled to the first joint portion, and

the first joint portion and the second joint portion are separated accompanied by the separating action of the bending action member and the actuator.

20. (Previously Presented): The manipulator according to claim 19, wherein

the second joint portion has an elastic body containing a fitting hole and configured for urging substantially perpendicularly to the transmitting direction of the drive power;

the first joint portion includes a projecting portion capable of being fitted to the fitting hole; and

the second joint portion is advanced substantially linearly along the transmitting direction of the drive power by the drive power generating means and fitted to the projection portion while generating the urging force to the projecting portion, so that the first joint portion and the second joint portion are coupled to connect the drive power transmitting means with the drive power generating means.